Lafayette Street Railway Power House
2 South Street
Tippecanoe County
Lafayette
Indiana

HAER IN-41



PHOTOGRAPHS
WRITTEN AND HISTORICAL DATA

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HISTORIC AMERICAN ENGINEERING RECORD

Lafayette Street Railway Power House

HAER IN-41

Location: 2 South Street, Tippecanoe County, Lafayette, Indiana.

Date of Construction: 1892, 1896, 1907 (demolished 1979)

Present Owner: Drago G. Panich
920 Ferry Street
Lafayette, Indiana 47901

Significance: The first electric street railway system was installed in Richmond, Virginia in 1887. Based on its success, the City of Lafayette, Indiana, authorized the Lafayette Street Railway Co. to convert its horsecar operation to the electric traction system. The first trail run occurred August 30, 1888. Thus did Lafayette complete one of the first electric street railways in the U.S.

The Lafayette Street Railway Power House was constructed in 1892 to generate current to power the horsecars equipped with electric motors. The power house was expanded in 1896 to meet increased demand, and a major addition was erected in 1907 to supply electricity to a burgeoning interurban system connecting Lafayette to other Indiana cities. While the power house only served its original function for 30 years, its association with the Lafayette Street Railway system establishes it as one of the nation's earliest transportation-related generating facilities.

The power house possesses considerable historic significance locally, as well, since the extension of street railway lines was pivotal in Lafayette's early growth and

development. The urban form of the city until World War II was to follow these transportation lines. Despite alterations to its structure and use, the power house retains its basic architecture. As such it serves as an excellent example of late 19th and early 20th century industrial architecture. With the removal of the streetcar tracks and overhead lines in the early 1940s, and with the exception of the trolley barn at 10th and Ferry Streets, the power house is a last reminder of the vanished streetcar era in Lafayette.

Historian:

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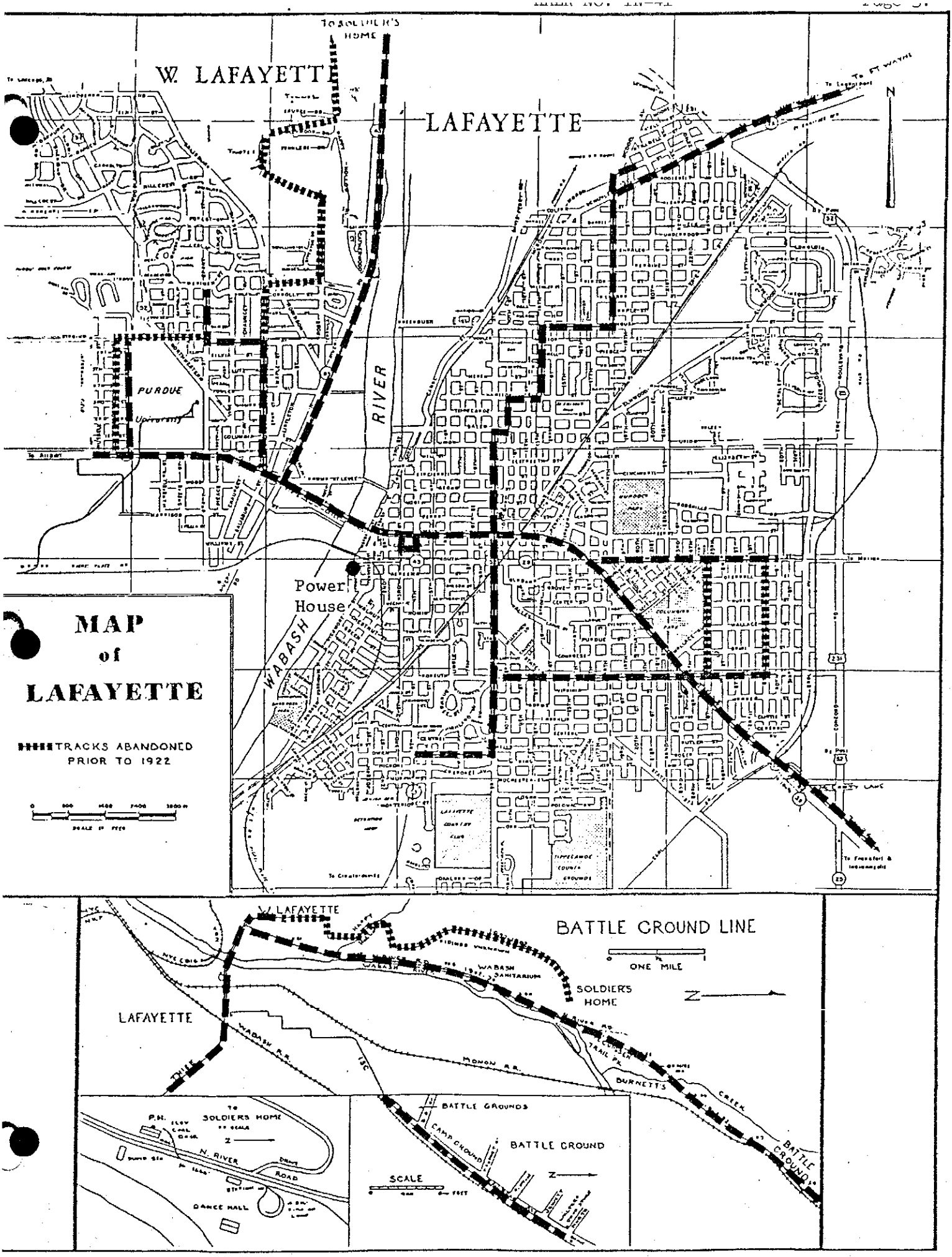
April 1980


W. LAFAYETTE
LAFAYETTE
PURDUE
University
RIVER
WABASH
Power House
MAP
of
LAFAYETTE
TRACKS ABANDONED PRIOR TO 1922
W. LAFAYETTE
BATTLE GROUND LINE
ONE MILE
SOLDIERS HOME
LAFAYETTE
WABASH R.R.
MONON R.R.
BURNETTS CREEK
BATTLE GROUNDS
CAMP GROUND
BATTLE GROUND
SCALE
N. RIVER ROAD
DANCE HALL

Street Railway History

The first street railway to operate over Lafayette's streets was the Ball Street Railway, which consisted of horse-drawn coaches riding on wooden rails. It commenced operation in 1868 but was abandoned several years later. On March 13, 1883, by authority granted by the City, the Lafayette Street Railway Company was organized by five local individuals.[1] Its operation began in May, 1884, and while traction consisted again of horses and mules, technical progress was evident in the use of iron rails.[2]

In 1887 a pioneering experiment using electric traction carried out by Frank Sprague in Richmond, Virginia demonstrated the practical application of electricity to urban transit. In a progressive spirit the City of Lafayette enacted an ordinance on April 10, 1888 approving the electrification of city lines. The first service transpired on September 3, 1888, and by August of the following year the entire system was electrified. The first cars utilizing electric traction were converted horsecars, but in 1891 new cars built for this purpose were ordered from the Brill Company of Philadelphia. While its rank in the history of electric streetcar systems has not been precisely fixed, it is safe to assume that Lafayette was one of the first cities in the United States to install an electric street railway, and possibly, the second such system after Richmond.[3]

In 1903 the Lafayette Street Railway Co. was bought by the Fort Wayne and Wabash Valley Traction Co. (FW&WV). It became part of a larger system consisting of the Fort Wayne Traction Co. and the interurban line connecting Fort Wayne, Logansport, Lafayette and Lima, Ohio.

On September 21, 1910 a FW&WV interurban was involved in a head-on collision that took 42 lives. The resulting litigation ultimately claimed the company itself. It was succeeded on February 26, 1911 by the Fort Wayne and Northern Indiana Traction Co. (FW&NI).

The operation of the Lafayette Street railway was severely disrupted in March 1913 by a flood of massive proportions along the Wabash River, which divides the cities of Lafayette and West Lafayette. Several lines operated across the Main Street bridge serving the campus of Purdue University and the Indiana State Soldier's Home. The flood carried away the Main Street bridge and shortly thereafter destroyed its temporary replacement. Service on the Soldier's Home line, a heavily patronized route because it terminated at the Tecumseh Park pavilion[4], was shut completely when its roadbed was washed away. On March 26, 1913 operation on the entire system was suspended when flood waters, cresting at 33 feet above flood stage, innundated the power house. Full service crossing the river was not restored until December 1914 when a new bridge was completed. However, with the resumption of service came stiff competition from jitneys, or private automobiles transporting fare-paying passengers, which appeared during the time of the flood.

As jitney competition increased during the second decade of this century, the economic fortunes of the FW&NI declined. In January 1920 the company, in receivership at the time, was dissolved by bond holders in order to rid the company of the moribund Lafayette system. The remaining healthy sections of the company were acquired by the Indiana Service Corporation, established for that express purpose. The Lafayette streetcar lines were reconstituted under the Lafayette Service Corporation. It inherited a system in dilapidated condition and mired in debt. The jitneys were siphoning off its profit

margin by taking away ridership from the line connecting the two cities, the system's most profitable route.

The Lafayette Service Corporation could not sustain its operations under such adverse conditions, and the company reverted to being in receivership on October 17, 1921.

A new company, the Lafayette Street Railway, Inc., was established on March 24, 1922. Under its management the streetcar system underwent a total physical renewal. It was at this time that the outmoded street railway power house, which was expensive to operate, was auctioned as surplus property.[5] The success of the refurbished system was ensured by a city ordinance prohibiting jitney competition.

In January 1925 an article appeared in the National Municipal Review, entitled "The Rehabilitation of a Street Railway: What Civic Spirit Did in One Small City," which recounted the Lafayette railway's remarkable transformation:

> In Lafayette is a street railway company operating 16.5 miles of track which in a little over three years has become a glaring success. The company is giving good service, has a uniform nickel fare, free transfers and is making money. Three years ago the street cars had a reputation of being the world's worst. The company was in poor financial and physical condition . . .
>
> . . . In 1919 . . . the earning power of the car lines was steadily declining. In 1921 (The Lafayette Service Co.) defaulted . . . and passed into receivership. At this time the schedules were slow and hard to maintain. There was no through routing. The

system operation was unnecessarily expensive. The company produced its own power but the out-of-date power plant was costly to maintain . . . In March, 1922 the Lafayette Service Co. was sold at public auction . . .

The local owners . . . formed the Lafayette St. Ry. Inc. By the end of 1924 some $275,000 had been spent on improvements. Tracks were relaid, surface repaired, some were abandoned, some mileage was restored, double track was extended, automatic switches installed, and 18 new one-man safety cars were purchased . . . Jitneys were barred from the street . . .

The company was a success from the start. In October, 1921 the operating deficit was $11,060 and in 1923 the operating income was $37,000. In less than two years of operating the new company was able to increase new earnings by over $48,000 and make a net profit of over $21,000. This was due to the increase in the volume of traffic and economics of operations . . . Putting in one-man cars cut the wage cost by 27 percent . . . The company purchased their power and saved 15 per cent on their power cost.

Headways on the upgraded system were reduced from 15 or more minutes to 12 minutes. On busy Main Street a 6 minute headway existed. These schedules were strictly maintained, and because of this new regime, a significant increase in passengers occurred. Compared to the first nine months of 1921, when the old company carried 2,045,172 revenue passengers, the new company carried 3,094,018 in 1923 and 3,098,516 in 1924 during a comparable period, an increase of over 50 percent. This gain more than offset the reduction in fare from seven to five cents and the introduction of a free transfer.[6]

The prosperity of the 1920's was, however, short-lived. What a city ordinance did to the jitney could not be repeated for the private automobile. Here in Lafayette, as all across the nation, the rubber-tired vehicle soon crowded the steel-wheeled trolley off the street. On March 14, 1940 the Lafayette Street Railway, Inc. was reincarnated as the Lafayette Transit Company, and buses took the place of streetcars. The last streetcar run took place May 11, 1940. Thus ended 51 years of electric railway operation in Lafayette.

One last footnote remains. The interurbans also competed with the local streetcars for room on the streets of the city. Interurban service was inaugurated December 1, 1903 by the Terre Haute, Indianapolis, and Eastern Traction Company (THI&E). On June 28, 1907 interurban operation from Lafayette to Logansport was begun by the Fort Wayne and Wabash Valley Traction Co.[7] On the THI&E the one-way fare to Indianapolis from Lafayette was $1.25 or $1.45 for an express. The Sunday round-trip excursion cost one dollar. This service ceased on October 31, 1930. Only local streetcars remained on Lafayette streets after May 21, 1932, when the Indiana Service Corporation discontinued their Lafayette - Fort Wayne service. Thus did "the greatest transportation era in Indiana (last) less than three decades insofar as Lafayette was concerned."

The Street Railway Power House: The Site and Structure

The power house, as shown in figure 1, is situated on the east bank of the Wabash River in Lafayette at the foot of South Street. It is located at the eastern approach of the Big Four Railroad Bridge; a spur from this line alongside the northern face of the power house served to deliver coal and to remove ash. The power house occupies a roughly trapezoidal site that is 0.58 acres in area; the dimensions of the site are indicated on the above figure.

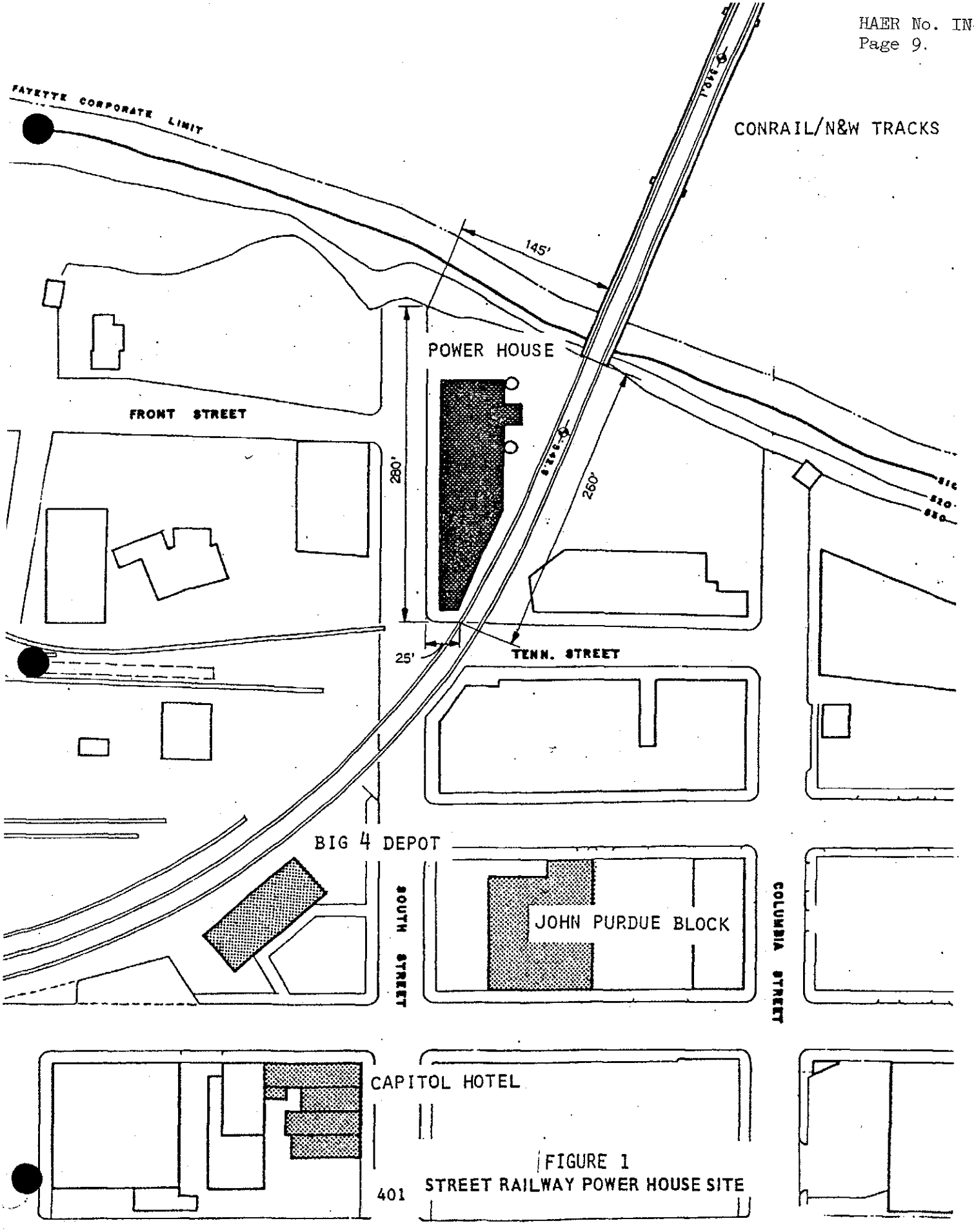



FIGURE 1
STREET RAILWAY POWER HOUSE SITE

The power house consists of two structures which share a common wall at their juncture: an original one-story brick structure, built in 1892 and expanded in 1896, and a trapezoid-shaped brick structure added to the east end in 1907. The approximate dimensions of the 1892/1896 structure are 57 ft. wide by 72 ft. long by 34 ft. high. The 1907 structure measures 57 ft. also at the common wall, 24 ft. on the east, 124 ft. on the south and 150 ft. on the north. The 1907 structure has a height of 32 ft., and the tower portion on the east end rises 48 ft. The power house, as noted in the history, was phased out of operation in 1922 and its generating equipment sold.

From 1922 to 1927 the power house was used by the Northern Indiana Gas Company as a warehouse. In 1927 it was occupied by the Oscar Winski-Salvage Co., which sold it to R. Lynn Shambaugh, in the mid-1930's, who operated a heavy equipment company. In 1945 this business was bought by Clint Crider, who continued the company's operation until 1971. The current owner is Drago Panich, a local architect, who leased the power house to Dungan's Used Auto Parts until 1978.

In December 1978 the 1892/1896 structure was severely damaged by arson. The fire caused extensive structural damage leading to the collapse of the roof. This portion was demolished in November 1979. The 1907 structure was unaffected and is still standing.[8]

The Street Railway Power House: Its Operation

Knowledge of the operation of the power house is available from theses written by Purdue students at the turn-of-the-century in fulfillment of their undergraduate engineering degrees. These theses date from the years 1898 and 1911, and each was based on an experiment to determine the operating efficiency of the power house. A description of the power house and its operation is taken directly from each paper.

1898[9]

The Station

The Power House is situated on the banks of the Wabash River at the foot of South Street. It is a substantial brick structure one story high with steel trusses and slate roof . . . It is divided into two rooms, a boiler room (photograph no. 1) and an engine and generator room (photographs nos. 2 and 3).

The main part was built in 1892, an addition of 18 feet being added to the east end in 1896 when it became necessary to enlarge the boiler plant.

Boiler Room

In the boiler room are situated three Stirling Water Tube Boilers manufactured by the Sterling Co. of Chicago. They are rated at 250 H.P. each . . .

The present demands of the plant require the continuous use of two boilers leaving one in reserve. Each boiler is run for about two weeks at a time, is then cut out, cleaned and held in reserve for two weeks.

## Fuel

The usual fuel is natural gas, with coal in reserve in case of "low gas." Boiler No. I is provided with air mixers while the others have a one half inch steam jet. The fireman in charge makes the statement that the air mixers are unsatisfactory on account of inability to "force" the fires under a heavy load. The supply to the boilers is automatically regulated by a reducing valve operated by the steam pressure.

## Water

At present the water supply is taken from the city mains, though connections are made for drawing the water from the Wabash river by means of a Marsh pump similar to the one which supplies the boiler. However, the river water was found to be undesirable at nearly all seasons of the year, and its general use was discontinued about three years ago.

The water used flows from the city mains to an open tank situated in front of the smoke stack, and above the level of boilers Nos. I & 2. This tank is 16 feet long and 3-½ feet in diameter and in general is used only as a settling basin. It is piped, however, for a live steam heater and is used as such while the regular heater is being cleaned.

From this tank the water flows by gravity into the Stillwell-Birch exhaust steam heater; the supply being regulated by an automatic cut off valve operated by a float. From the heater the water is pumped to the boilers by a Marsh Steam Pump manufactured by the Battle Creek Machinery Co. of Battle Creek, Michigan. There is in reserve a small Davidson pump piped to supply the boilers direct from the settling tank.

The water connections are well designed in many ways, allowing as they do the use of either heater alone or of the settling tank and one heater or of a by-pass around both heater and tank.

## ENGINE AND DYNAMO ROOM

The apparatus in the engine and dynamo room is shown in plan in the accompanying blue print (photograph no. 2 ). Briefly it consists of two Hamilton Corliss Engines, one 22 x 48 in. rated at 250 H.P. and the other 28 x 54 in. and rated at 500 H.P. These engines are belted to either end of the line of shafting in the west end of the building, connections being made thereto by friction clutches. This arrangement gives a considerable degree of flexibility allowing as it does the use of either engine alone or both together, also making it possible to change from one to the other without interupting the service.

The dynamo equipment consists of the following machines:

| | | | |
|---|---|---|---|
| 1 General Electric | 6 pole | 200 K.W. | St. Ry. Generator. |
| 2 Edison bi-polar | | 100 K.W. | St. Ry. Generators. |
| 2 Edison bi-polar | | 60 K.W. | St. Ry. Generators. |
| 2 Edison bi-polar | | 25 K.W. | 250 Volt Generators. |

These machines are all belted to the shafting mentioned, the system being inflexible except for a clutch connection which separates the 200 K.W. G.E. Generator, and one 60 K.W. Edison machine from the others.

The electrical equipment was furnished by the General Electric Co. of Schenectady, N.Y. and the shafting, pulleys etc., by the Hill Clutch Co. of Cleveland, Ohio.

## Switch Board

The Switch Board is located in the east end of the dynamo room and, as shown by photograph no.4 , consists of four panels each 5 feet wide. Surmounting them is a small panel containing a clock and two steam gauges.

On the switch board each of the Edison type St. Ry. generators has a three pole, single throw switch, a Westinghouse Electro-magnetic circuit breaker and a Bergman ammeter in circuit. Each of the Edison 250 volt machines is similarly provided except the switch which is double pole quick break. The General Electric generator is provided with two single throw, quick break switches, a General Electric automatic circuit breaker, a General Electric lightening arrester and a Weston station ammeter. The equalizing switch being situated near the machine.

Besides the ammeters in circuit with each machine there is a Weston 1000 ampere ammeter which measures the entire output of the 500 volt machines.

Each St. Ry. feeder leaving the station is protected by a General Electric 500 volt lightening arrester, a Westinghouse circuit breaker and a double pole quick break switch.

The feeder supplying the 500 volt stationary motors is protected by a circuit breaker manufactured by the Automatic Circuit Breaker Co. of Newago, Mich., an Ajax lightening arrester and a quick break double pole switch.

The instruments belonging to each feeder and each machine are placed in a vertical line and are in order beginning at the north end of the board:

First Panel.

1 Instruments protecting G.E. 200 K.W. dynamos.
2 Instruments protecting Soldiers Home St. Ry. Feeder. and totalizing ammeter.
3 Instruments protecting 500 volt stationary Motor.

Second Panel.

1 Instruments protecting 60 K.W. Dynamo No. 582
2 Instruments protecting 60 K.W. Dynamo No. 583
3 Instruments protecting 25 K.W. Dynamo No. 221

Third Panel.

1 Instruments protecting 25 K.W. Dynamo No. 222
2 Instruments protecting 100 K.W. Dynamo No. 300
3 Instruments protecting 100 K.W. Dynamo No. 299

Fourth Panel.

1 Instruments protecting West Side St. Ry. Feeder.
2 Instruments protecting Oakland St. Ry. Feeder.
3 Instruments protecting South Ninth St. Ry. Feeder.
4 Instruments protecting North Ninth St. Ry. Feeder.
5 Instruments protecting Tecumseh Lighting Circuit.

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The voltage is measured by a Weston portable volt meter reading to 600 volts which is arranged to plug into each circuit as desired.

The switch board is made of oak wainscotting finished with hard oil and presents not an unattractive appearance. However, it was not designed for the present requirements and as a result has numerous additions and changes the connections on the back are exceedingly complex.

## Feeders

There are, as indicated in the paragraph on switch board, seven main 500 volt feeders leaving the station, of which five are used to supply power to the street railway and two to furnish motor power and lights. There are also two feeders from the two 25 K.W. machines making a total of nine feeders leaving the station. Table 1 gives the obtainable data regarding them.

Table No. 1

Feeder Data

| Designation | Size Conductor | Length | Load |
|---|---|---|---|
| Soldiers Home | 0000 B & S | 4-½ miles | St. Cars |
| Commercial Motor | 00 B & S | 1-½ miles | Motors |
| West Side | 00 B & S | 1-½ miles | St. Cars |
| Oakland | 00 B & S | 1-¼ miles | St. Cars |
| So. Ninth St. | 00 B & S | 1-½ miles | St. Cars |
| No. Ninth St. | 00 B & S | 1-½ miles | St. Cars |
| Tecumseh Trail | 4 B & S | 5-¼ miles | Lights |
| Power No. 1 | 00 to 4 | 1-3/4 miles | Lights |
| Power No. 2 | 4 B & S | 3/4 miles | Lights |

## 500 Volt Commercial Circuit

The 500 volt Commercial circuit supplies current to stationary motors the rated H.P. of which aggragates about 90 H.P. Some of the largest are located as follows:

| | | |
|---|---|---|
| Loeb & Hene | Elevator | 15 H.P. |
| Loeb & Hene | Cash System | 5 H.P. |
| O.W. Pierce | | 15 H.P. |
| O.P. Benjamin | | 15 H.P. |
| Emerson-Burt | | 10 H.P. |
| Home Journal | | 5 H.P. |
| Courier | | 7½ H.P. |
| Courier | | 3 H.P. |

## Description of Plant

### Boilers

| | |
|---|---|
| Kind | Stirling Water Tube |
| Number | 2 |
| Rated Capacity | 250 H.P. |
| Diameter of Tubes | 3-1/4 in. |
| Average length of tubes | 13 ft. |
| Number of tubes | 259 |

| | |
|---|---|
| Area of heating surface | 2875 sq. ft. |
| Area of grate surface. | 57.69 sq. ft. |

Smoke Stack

| | |
|---|---|
| Kind | Steel, Conical base. |
| Diameter at base | 5 feet. |
| Diameter at top | 4 ft. 1 inch. |
| Height | 125 feet. |
| Lined with brick | 65 feet. |

Engine (Old)

| | |
|---|---|
| Kind | Hamilton Corliss. #976 |
| Made by | Hooven Owens & Rentschler |
| Diameter of cylinder | 22 inches |
| Stroke | 48 inches |
| Diameter piston rod | 3 inches |
| Diameter of fly wheel | 16 feet |
| Face of fly wheel | 31 inches |
| Rated capacity | 250 H.P. |
| Rated speed | 76.5 R.P.M. |

Engine (New)

| | |
|---|---|
| Kind | Hamilton Corliss #1193 |
| Made by | Hooven Owens & Rentschler |
| Diameter of cylinder | 28 inches |
| Stroke | 54 inches |

| | |
|---|---|
| Diameter of piston rod | 4-5/8 inches |
| Diameter of fly wheel | 18 feet |
| Face of fly wheel | 50 inches |
| Piston displacement H.E. | 19.242 cu. ft. |
| Piston displacement C.E. | 18.684 cu. ft. |
| Piston speed | 612 ft. per minute |
| Clearance (From Cards) H.E. | 2-½% |
| Clearance (From cards) C.E. | 3-½% |
| Rated capacity | 500 H.P. |
| Rated speed | 68 R.P.M. |
| Average speed during test | 69.6 R.P.M. |
| Belt speed | 3845 ft. per minute |

Pumps

| | |
|---|---|
| Kind | Marsh Steam Pump |
| Made by | Battle Creek Machinery Co. |
| Number | 2 |
| Diameter of steam cylinder | 8 inches |
| Diameter of water cylinder | 5 inches |
| Stroke | 10 inches |

| | |
|---|---|
| Kind | Davidson Steam Pump |
| Made by | Davidson Steam Pump Co., Philadelphia, PA. |
| Number | 1 |
| Diameter of Steam cylinder | 5 inches |
| Diameter of water cylinder | 3 inches |
| Stroke | 8 inches |

Dynamos

| | |
|---|---|
| Kind | General Electric Multipplar St. Ry. Generator |
| Rated capacity | 200 K.W. |
| Voltage | 500 No load, 550 full load |
| Speed (Rated) | 425 R.P.M. |
| Speed when tested | 425 R.P.M. |
| Number | 1 |

| | |
|---|---|
| Kind | Edison Bi-polar Ry. Generators |
| Rated capacity | 100 K.W. |
| Voltage | 500 |
| Speed (Rated) | 650 R.P.M. |
| Speed when tested | 647 R.P.M. |
| Number | 2 |

| | |
|---|---|
| Kind | Edison Bi-polar Ry. Generator |
| Rated capacity | 60 K.W. |
| Voltage | 500 |
| Speed (Rated) | -- |
| Speed (When tested) | 827 R.P.M. |
| Number | 2 |

| | |
|---|---|
| Kind | Edison Bi-polar Shunt |
| Rated capacity | 25 K.W. |
| Voltage | 250 |
| Speed (Rated) | 1300 R.P.M. |
| Speed (When tested) | 1135 R.P.M. |
| Number | 2 |

## Road

| | |
|---|---|
| Length | 18 miles |
| Kind of rail | T |
| Weight of rail per yard | 56 lbs. |
| Supported | On wood cross ties |
| Ballast | Gravel and sand |
| Condition of track during test | Clean and moist |

## Road Equipment

12 open cars. Length over all 25 ft. Weight 3300 lbs.

12 closed cars. Length over all 18 ft. Weight 3600 lbs.

1 flat car. Length over all 18 ft. Weight 4000 lbs.

1 salt car. Length over all 14 ft. Weight 4000 lbs.

10 equipments G.E. #800. Weight 8000 lbs.

6 equipments Edison #14. Weight 8000 lbs.

## The System

The track system is divided into four principle parts which center at the Court House and extend about two miles from that point, and one line to the Soldiers Home four and one half miles away. This latter line runs for about one and one-fourth miles over the west side tracks, the cars starting from the Court House at the same time. On each of the four principle

divisions two cars are run, each traversing the length of track once in fifteen minutes. These cars all start on their respective trips on the even quarter hours. On each line leaving the Court House the cars strike a hill about one-half a mile away. Three of these hills are abrupt and tax the car motors to their utmost to drive a heavily loaded car up them, while the rise on the North Ninth Street line is quite gentle.

As a result of these conditions we have a considerable current at the starting time which falls off somewhat when the cars attain their normal speed. About six or seven minutes after starting the outbound cars strike the hills and the current goes rapidly up, falling off again when the tops of the hills are reached. When the cars arrive at the ends the current falls off until, for two or three minutes before starting again, there is practically no current used.

The whole system then presents a condition of rapidly varying loads, the rapidity and extent of which variations it is almost impossible to appreciate. It is no unusual thing for the load to change two or three hundred amperes in one or two seconds and the maximum load liable at any time to come upon the station, is many times the average load for the day or hour.

To meet these conditions it is necessary to have the station capacity much greater than the size of the city and extent of the system would seem to demand.

1911 [10]

## The Plant

The power plant of the Ft. Wayne & Wabash Valley Traction Co. is situated

on the bank of the Wabash river at the foot of South Street in Lafayette, Indiana. In this location an ample source of water supply is available and coal may be taken from the Big Four railroad whose main line tracks are within twenty feet of the building. A short spur track serves the bunkers which will receive about 22 carloads of coal. Photograph no.5 is a view of the plant from the Main Street bridge showing the building, the two concrete stacks, coal elevator, and high tension tower.

Aside from supplying power for the railway purposes, about one fourth of the entire output of the plant is generated at 2200 volts, 2 phase, 60 cycle and sold to the Indiana Lighting Co. by whom it is distributed for lighting and power purposes. The latter company maintains within this plant a substation consisting of two motor-generator sets operating upon a three-wire d.c. system to supply power to motors at 250-500 volts.

## Steam Generating Apparatus

The boiler room is equipped with Stirling boilers, four of 324 h.p. each and two of 420 h.p. rated capacity each. All are fitted with Green chain grates. Photograph no.6 is a view of the boiler room. Apparatus in center of room is a feed water pump, temporarily placed for use in the boiler test. In the background is the coal elevator. Worthington jet condensers and feed water heaters are installed. (Photograph no. 7 is a plan of the power house.)

## Electrical Apparatus

Main Generating Units:

Four steam generating units carry the load of the station. Two of these are

Westinghouse a.c. generators, direct-connected to Westinghouse-Parsons turbines; the other two are Westinghouse engine type generators driven by Hamilton-Corliss compound engines. Specifications of the units are as follows:

Westinghouse a.c. generator, 3 phase, 500 kw., 25 cycles, 400 volts. 760 amperes per terminal, driven at 100 r.p.m. by 650 h.p. Hamilton-Corliss compound engine. This generator may be used either 3 phase or 6 phase.

Westinghouse a.c. generator, 3 phase, 500 kw., 25 cycles, 380 volts, 760 amperes per terminal, driven at 100 r.p.m. by 850 h.p. Hamilton-Corliss tandem compound engine. This unit is shown in photograph no. 8.

Westinghouse a.c. turbo-generator 3 phase, 400 kw., 25 cycles, 375 volts, 616 amperes per terminal, driven at 1500 r.p.m. by Westinghouse-Parsons steam turbine.

The three above mentioned units supply the Lafayette street railway with power at 550 volts d.c. through rotaries located in the plant and also operate in parallel with the Spy Run plant at Ft. Wayne by means of a 33,000 volt transmission line which supplies the various substations of the interurban road.

Westinghouse a.c. generator 500 kw., 2 phase, 60 cycles, 2200 volts, 109 amperes per terminal, driven at 3600 r.p.m. by Westinghouse-Parsons horizontal turbine.

The entire output of this machine with the exception of the station lighting is sold to the Indiana Lighting Co.

## Three Wire System Apparatus

The motor generator sets used by the Indiana Lighting Co., to supply their three-wire power system are rated as follows:

General Electric induction motor #71160, 200 h.p. 2080 volts, 66 2/3 cycles, 45 amperes per phase, direct-connected to G.E. d.c. generator, 250-275 volts, 545 amperes running at 571 r.p.m.

A second set, induction motor #71159 is exactly identical.

## Railway Substation Apparatus

The local railway load is supplied from two rotary converters rated as follows:

Westinghouse 500 kw., 550 volt, 909 amperes d.c. running at 500 r.p.m. using 3 phase power at 380 volts. A 3 phase 25 cycle, 380 volt induction motor is direct-connected for starting purposes.

General Electric 500 kw., 500 volts d.c., 833 amperes d.c. running at 500 r.p.m. using 6-phase, 25-cycles power at 220 volts.

Exciters:

The station is equipped with five exciting units with wiring and switch-boards so arranged that any desired exciter or combination may be used to supply the exciter buses. The voltage used is 125 volts. The exciters are rated as follows:

Westinghouse d.c. generator, 22 kw., 176 amperes, driven at 380 r.p.m. by Ideal horizontal steam engine.

General Electric d.c. generator, 30 kw., 240 amperes, driven at 305 r.p.m. by single cylinder G.E. Marine steam engine.

Westinghouse d.c. generator 10 kw., 80 amperes mounted on shaft of 25-cycle turbo-generator.

Westinghouse d.c. generator, 37-½ kw., 300 amperes, driven at 513 r.p.m. by 50 h.p. induction motor using 3-phase, 380-volt power.

The exciter capacity is more than adequate for the needs of the plant and the two steam driven exciters are usually held in reserve.

## High Tension Apparatus

Three oil-cooled transformers of 375 kva. capacity each are located in the east end of the building. These are used to step up from generated voltage of 380 to transmission voltage of 33,000. A large oil switch is located on a platform back of the transformers and is operated by a rod extending to the switchboard. Multigap lightning arresters are hung on the walls.

Switchboards:

The switchboard consisting of 23 panels is located on the main generating floor and extends along the north wall and across the station in front of the high tension transformers. Portions of the board as well as the transformers may be seen in photograph no. 9.

Many of the switchboard instruments are of the old undamped type and very difficult to read accurately if the load is unsteady.

Auxiliary:

A synchronous frequency changer is installed. It consists of a 25 cycle 375 volt, 540 h.p. motor shaft-connected to a 60 cycle, 2200 volt machine of equal capacity. This machine may be used to supply the 2200 volt, 60 cycle load of the Indiana Lighting Co., in case of a shut down of the 60 cycle turbo-generator, or, as is usually the case, it may be run at no load as a synchronous condenser to improve the power factor of the load.

Notes

1. These individuals were Freeland B. Caldwell, Charles M. Caldwell, Frank D. Caldwell, William B. Chambers and James O. Lake.

2. Unless otherwise stated, historical information is taken from: Chambers, David W., "The Lafayette Street Railway," Bulletin No. 32, Electric Railway Historical Society, Chicago, Illinois, November, 1958.

3. Knoll, H.B., The Story of Purdue Engineering, Purdue University Studies, 1963, pp 283-84. According to Knoll, Lafayette installed the nation's second substantial electric street railway system. It was begun in the summer of 1888 by men who had just completed the nation's first electric street railway in Richmond, Virginia.

4. Chambers, pp 9-10.

The following description of Tecumseh Trail Park indicates the important role that the Lafayette Street railway played in the life of the community. A trolley line was extended to the park to serve the Indiana State Soldier's Home, which was established in 1896 on a bluff overlooking the Wabash some 4 miles from the center of Lafayette. While the line was intended to serve employees and visitors to the Soldier's Home, the park itself soon became a major destination point for Lafayette residents seeking recreation and relaxation. The park, consisting of twenty acres along the west bank of the Wabash, retained much local history:

> Through this park ran the trail used by the Indians from earliest times in their passage to and from the trading posts along the Wabash. The trail was named for Tecumseh, the famed Shawnee Indian Chief, whose brother led the Red man against the troops of William Henry Harrison in the battle of Tippecanoe on November 7, 1811. This action occurred north of Tecumseh Trail Park . . .
>
> In June, 1896 Tecumseh Trail Park, down below the Soldier's Home grounds, had been purchased by the Lafayette Street Railway and was developed as an amusement park enterprise to stimulate street car travel. This custom was prevalent among street railways throughout the nation. The . . . line was popular with the people of Lafayette and West Lafayette who patronized the large dancing and refreshment pavilion located at the Trail Park . . . Fishing, swimming, horseshoe pitching, boating, canoeing, picnicing, nature hikes, and band concerts were among the numerous attractions at the Trail Park. Lighting of the park grounds was furnished by an independent circuit from the street railway powerhouse in Lafayette.

In August 1919 the pavilion was destroyed by fire, and due to the diminished attraction of the park, the street railway system lost a significant amount of patronage on the Soldier's Home line. The park and its attractions, coupled with the refreshing ride on an open trolley car along the banks of the Wabash, were expressive of a way of life that perished with the passing of the trolley era.

5. "Modernization Increases Riding in Lafayette," Electric Railway Journal, January 26, 1929, p 155.

   "In March, 1922 the property was offered at public auction. An old amusement park brought $6,000; the local utility paid $95,000 for the railway power plant, and the street car property and such equipment as had not been rented finally were purchased for $75,000 by a group of local citizens."

6. Electric Railway Journal, p. 155.

7. Knoll, pp. 283-284.

   Indiana, because of its level topography, was particularly suited to the development of the interurban system. By 1911, 2300 miles of track were in operation. Indianapolis was the interurban center of the nation.

8. Lafayette Railroad Relocation Project, Final Environmental Impact Statement, p. 400, 402.

9. "Report of Efficiency and Economy Tests on the Lafayette Street Railway Power Plant," an unpublished bachelor's thesis by George W. Munro, Harold W. Cope, Albertus Fankboner, Charles A. Simpson, Purdue University Archives, West Lafayette, Indiana, May 1898.

10. "Test of the Fort Wayne and Wabash Valley Traction Co's. Power Station at Lafayette, Indiana," an unpublished bachelor's thesis by William Marshall Kane, Waldo Wayne Kellams, Robert Markley Kunse, and Clinton Tyler Miles, Purdue University Archives, West Lafayette, Indiana, June 1911.

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"Test of the Fort Wayne and Wabash Valley Traction Co's. Power Station at Lafayette, Indiana," a bachelor's thesis by William Marshall Kane, Waldo Wayne Kellams, Robert Markley Kunse, and Clinton Tyler Miles, Purdue University Archives, West Lafayette, Indiana, June 1911.

"A History of the Past Commercial Transportation in Lafayette, Indiana," by William Hilemon, Tippecanoe County Historical Association, Lafayette, Indiana.

Mr. Hilemon was the car dispatcher and assistant superintendent of the Lafayette street railway from 1906 to 1923.

Other related unpublished papers.

"Car Test on Lafayette Street Railway System." a bachelor's thesis by Samuel Kahn, Zac Hanscon and Weeden Lindley Greene, Purdue University Archives, West Lafayette, Indiana, June 10, 1903.

"Power Consumption on the Various Lines of the Lafayette Street Railway," a bachelor's thesis by Paul Kelso Weaver and Robert Alonzo Merritt, Purdue University Archives, West Lafayette, Indiana, June 1909.

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Chambers, David W., "The Lafayette Street Railway," Bulletin No. 32, Electric Railway Historical Society, Chicago, Illinois, November, 1958.

The original manuscript and published copies can be found in the archives of the Tippecanoe County Historical Association, Lafayette, Indiana.

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"Modernization Increases Riding in Lafayette," Electric Railway Journal, January 26, 1929, p.155

Title unknown, The Street Railway Review, vol. IV, no. 5, 1894, pp. 276-277.

This article discusses the Lafayette Street Railway Power House, but it could not be located by the author of this report.